

***Triso*, a New Generic Name for the Serranid Fish Previously Known as *Trisotropis dermopterus*, with Comments on its Relationships**

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(Received February 15, 1988)

Abstract The generic name *Triso* is proposed for the epinephelin fish recent authors have identified as *Trisotropis dermopterus* (Temminck et Schlegel). *Trisotropis* Gill is a junior synonym of *Mycteroperca* Gill. *Triso* is distinctive in its short head, broad interorbital, foreshortened neurocranium, anteriorly inclined parasphenoid, high and laterally oriented frontoparietal crests, high dorsal fin-ray counts, and pouch-like esophageal swellings. *Altiserranus woorei* Whitley from New South Wales is placed in the synonymy of *T. dermopterus*. *Altiserranus* Whitley, type species *Epinephelus multinotatus* (Peters), is synonymized with *Epinephelus* Bloch. *T. dermopterus* occurs in the Northern Hemisphere off Japan, Korea, Taiwan, and China, and in the Southern Hemisphere off eastern and western Australia; thus it is antitropical in distribution. Available evidence indicates that *Triso* may be most closely related to the New World genus *Paranthias* Guichenot.

Temminck and Schlegel (1842–1850: 10) described *Serranus dermopterus* from one adult 7½ pouces (203 mm) in length and two juveniles from the vicinity of Nagasaki, Japan. It was not without hesitation that they regarded it as one of the “mérours” (=groupers). They noted that it had the principal epinephelin characters but was unusual in such features as its small head, very small scales, and long dorsal fin of uniform height.

Günther (1859: 154) maintained the species in *Serranus*, referring to it as, “A somewhat aberrant species.” Steindachner (1892: 359, pl. 2, fig. 1) also classified it in *Serranus*. Boulenger (1895: 269), however, shifted the species to the genus *Epinephelus* Bloch and extended its range to the coast of China.

Surprisingly, Jordan and Richardson (1910: 462, fig. 14) placed *dermopterus* in the genus *Trisotropis* Gill (1865), the type species of which is *Johnius guttatus* Schneider=*Mycteroperca venenosa* (Linnaeus), and further in the subgenus *Archoperca* Jordan et Evermann (1896), type species *Mycteroperca boulengeri* Jordan et Starks. They have been followed in this generic placement by other authors such as Jordan, Tanaka and Snyder (1913: 158, fig. 116), Schmidt (1931: 57), Honma (1952: 145), Mori (1952: 87), Katayama (1960: 10, pl. 66), Chan (1968: 19, pl. 2), Lindberg and Krasnyukova (1969: 106, fig. 156), Burgess and Axelrod (1974: 1251, fig. 246), Chang, Shao and Lee (1979: 80), Shen (1984: 41, fig. 289–29),

Katayama in Masuda et al. (1984: 132, pl. 118 D), and Chu (1985: 24, fig. 361).

Unaware of *Trisotropis dermopterus*, Whitley (1951: 396, fig. 5) described this species as *Altiserranus woorei* from one specimen taken off Laurieton, New South Wales, Australia. Whitley (1947: 150) had previously erected the genus *Altiserranus*, type species *Serranus jayakari* Boulenger (= *Epinephelus multinotatus* (Peters), according to Randall, 1987). *Altiserranus* is here placed in the synonymy of *Epinephelus*.

Norman (1957: 236) correctly synonymized *Trisotropis* and *Archoperca* with *Mycteroperca* Gill (1862). As noted by Smith (1971: 172) and Johnson (1983: 784), *dermopterus* does not belong in *Mycteroperca* or any currently named genus of the tribe Epinephelini. It is the sole representative of a new genus which we here name *Triso*. A diagnosis of this genus, a redescription of the species, and a discussion of the relationship of the genus within the tribe are provided.

We have examined specimens of *Triso dermopterus* in the Australian Museum, Sydney (AMS); Bernice P. Bishop Museum, Honolulu (BPBM); California Academy of Sciences, San Francisco (CAS); Naturhistorisches Museum, Vienna (NMW); Queensland Museum, Brisbane (QM); U. S. National Museum of Natural History, Washington, D. C. (USNM); Western Australian Museum, Perth (WAM); and Department of Zoology, University Museum, University of To-

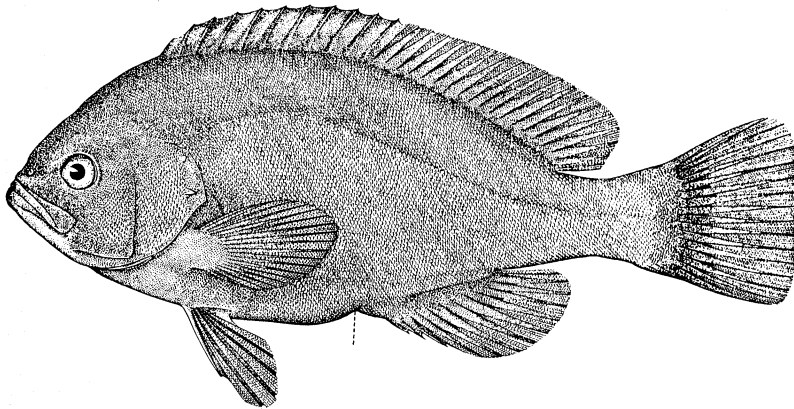


Fig. 1. *Triso dermopterus* (Temminck et Schlegel) (from Katayama, 1960: pl. 66).

kyo (ZUMT).

Lengths of specimens given below are standard length (SL). Methods of counting and measuring follow Randall (1987).

Triso gen. nov.

Type species, *Serranus dermopterus* Temminck et Schlegel, 1842.

Diagnosis. Dorsal rays XI,18–21; anal rays III,9–10 (rarely 9); pectoral rays 18–20; scales ctenoid and small, 67–76 in lateral line and 131–145 in longitudinal series; body deep, 2.4–2.75 in SL, and compressed, the width 1.95–2.85 in depth; head very short, 3.0–3.45 in SL; snout short, 3.1–4.2 in head; interorbital very broad, its fleshy width 2.9–3.7 in head, and strongly convex; cranium short and stout with well-developed, laterally inclined frontoparietal crests and a parasphenoid that is tilted upward just below the basisphenoid so that its anterior half is oblique; mouth relatively small, the maxilla not extending posterior to a vertical through rear edge of pupil, the upper jaw length 2.35–2.55 in head; teeth small, in villiform bands in jaws, on vomer and palatines, with a pair of short canines anteriorly in each jaw; esophagus with a pouch-like swelling of one to three lobes on each side just anterior to stomach; dorsal spines and rays nearly uniform in height; caudal fin truncate, the corners rounded.

Remarks. Katayama (1959, 1960) presented extensive data on the comparative osteology of *Triso* (as *Trisotropis*). Figures 18 and 19 of his 1959 paper clearly show the distinctive fore-

shortened neurocranium and the inclined anterior part of the parasphenoid compared to the crania of other genera of the tribe Epinephelini that he examined. Katayama also noted the unique swellings of the esophagus. These features, combined with the deep body, short head, broad and highly convex interorbital, and high count of the dorsal and anal soft rays (*Triso* has the highest average dorsal-ray count of the Epinephelini) readily diagnose it as a distinct genus.

Etymology. *Triso* is an abbreviation of the misapplied *Trisotropis*.

Triso dermopterus

(Temminck et Schlegel, 1842)

(Japanese name: Tobihata)

(Figs. 1, 2B)

Serranus dermopterus Temminck and Schlegel, 1842: 10 (type locality, Nagasaki, Japan).

Altiserranus woorei Whitley, 1951: 396, fig. 5 (type locality, Laurieton, New South Wales, Australia).

Description. Dorsal rays XI,18–21 (one of 20 with 18); anal rays III,9–10 (one of 20 with 9); pectoral rays 18–20 (usually 19); pelvic rays I, 5; principal caudal rays 17, the upper and lower unbranched; lateral-line scales 67–76; longitudinal scale series 131–145; gill rakers 8–9+16–18; branchiostegal rays 7; predorsal bones 2, the formula for their arrangement with anterior neural spines and dorsal pterygiophores 0/0/1/1+1/; vertebrae 10+14; pyloric caeca 14–16 (Katayama, 1960).

Body deep, the depth 2.4–2.75 in SL, and com-

pressed, the width 1.95–2.85 in depth; head very short, 3.0–3.45 in SL (head proportionally smaller, in general, in larger individuals); snout short, 3.1–4.2 in head; interorbital space very broad, its fleshy width 2.7–3.7 in head, and strongly convex; suborbital depth 7.0–10.3 in head; least depth of caudal peduncle 2.4–2.75 in head.

Mouth relatively small for an epinephelin, the maxilla not extending posterior to a vertical through rear edge of pupil, the upper jaw length 2.35–2.55 in head; mouth strongly oblique, the lower jaw projecting; supramaxilla present; a pair of short caniniform teeth anteriorly on each premaxilla; a single short caniniform tooth anteriorly on each dentary; remaining teeth in each jaw in a villiform band, narrowing posteriorly to one or two rows; a narrow, V-shaped band of teeth on vomer and a narrow, straight band on each palatine. Nostrils subequal, located anterior to center of eye, the posterior nostril about half an orbit diameter in front of edge of orbit.

Opercle with three spines, the middle one most posterior and nearer lower than upper spine; posterior margin of preopercle finely serrate, the somewhat produced angle with slightly enlarged serrae; ventral margin of preopercle and margins of subopercle and interopercle smooth; upper edge of opercle obtusely angular, the opercular flap not strongly pointed.

Scales very small, ctenoid on head and body; small scales present on side of maxilla. Lateral line slightly arched anteriorly, following dorsal contour of body to straight peduncular part, and continuing three-fourths distance to end of caudal fin; tubules of lateral-line scales simple.

Origin of dorsal fin above opercular spines; dorsal and anal spines relatively slender; interspinous membranes of dorsal fin only slightly incised; fourth to eleventh dorsal spines subequal, the longest 2.2–2.8 in head; third to eleventh dorsal soft rays subequal, the longest 1.8–2.4 in head; third anal spine longer than second, 2.9–3.4 in head; second or third anal soft ray longest, 1.4–1.65 in head; caudal fin subtruncate with rounded corners, the fin length 1.2–1.4 in head; pectoral fins 1.4–1.55 in head; pelvic fins not approaching anus, their length 1.3–1.7 in head.

Color in preservative uniform dark brown, the fins still darker, beoming blackish toward edges. Katayama in Masuda et al. (1984) gave the life color as violet-black. The third author noted

that the inside of the mouth of freshly caught fish is yellowish. Some individuals, particularly smaller fish, may have a fine white margin on the upper part of the caudal fin.

Remarks. The proportional measurements given above are based on 15 specimens, 127–555 mm SL.

Boeseman (1947: 28) reported on the type specimens of *Serranus dermopterus* in the Rijksmuseum van Natuurlijke Historie in Leiden. The largest, which he designated as the lectotype, is a stuffed specimen that was collected by Burger; it measures 160 mm SL and 195 mm in total length. Von Siebold collected the two smaller specimens which are preserved in alcohol; these measure 28 and 53 mm SL.

Triso dermopterus occurs in the Northern Hemisphere from Japan at 38° to Taiwan and Hong Kong at 22°. In the Southern Hemisphere we have examined specimens from eastern Australia in the latitudinal range of 25° to 32°; in western Australia north of Dampier at 19°30'. From the known distribution it appears that this species is antitropical (or more precisely anti-equatorial) in its distribution.

The third author observed this species at the wreck of a World War II aircraft located 12 miles east of Burnett River Heads, Queensland. The plane lies in 22 m on seagrass and sandy bottom. Fish were seen in the size range of approximately 75 to 300 mm SL. They were solitary and around the upper part of the wreckage. The juveniles fed in the water column on zooplankton, but feeding by adults was not observed. However, adults such as QM 21314, 270 mm SL, have been taken by angling with small fishes such as *Sardinops neopilchardus* as bait. When frightened, this species does not move to the substratum but retreats 3–4 m above it.

Chuichi Araga (pers. comm., 1986) has informed us that *Triso dermopterus* is very rare in the vicinity of Shirahama, Wakayama Prefecture, Honshu. Only two fish of this species have been maintained in the Shirahama Aquarium during the past 10 years, one of which is illustrated in Plate 118 of Masuda et al. (1984). These fish were caught by hand-line fishermen using live red shrimp (*Metapenaeopsis* sp.) for bait over rocky bottom in the depth range of 40 to 70 m. In the aquarium they were fed on cut fish and small frozen shrimp (*Palaemon paucidens* and *Euphasia superba*). The

longest period of survival in the aquarium was about three years. Araga commented that this is "rather short for large-size serranids".

Araga has never seen this fish while SCUBA diving around Shirahama, but he reported that H. Masuda observed it at Suruga Bay, Honshu around a wreck on sandy bottom in 25 m. Because of its active swimming above the bottom and its general shape, he thought at first glance that it was a species of *Girella*.

Some specimens of *T. dermopterus* have been taken by trawls over silty sand or mud bottoms. The largest specimen we have examined, WAM P. 26876-001, 555 mm SL, was collected by trawling 130 km north of Dampier, Western Australia at a depth of 94–103 m.

As mentioned in the generic diagnosis, one of the most distinctive features of *T. dermopterus* is the presence of outpockets of the esophagus just anterior to the stomach. They are lined with fleshy ridges that are similar to, but notably larger than, those lining the main esophageal tube. The function of these pouches is unknown.

Material examined. JAPAN: Tokyo fish market, ZUMT 54886, 280 mm; ZUMT 54887, 245 mm; ZUMT 54888, 317 mm. Shizuoka Prefecture, ZUMT 33379, 84 mm. Mie Prefecture, Shima, ZUMT 19924, 193 mm. Wakayama Prefecture, ZUMT 7463, 92 mm; ZUMT 20273, 110 mm; ZUMT 20532, 75 mm; ZUMT 22016, 63.5 mm; BPBM 30844, 126 mm (cleared and stained). Hachijo Island, USNM 17777, 533 mm. Nagasaki, ZUMT 3695, 243 mm. CHINA: off Yangtze Harbor, NMW 39255, 337 mm. HONG KONG: Aberdeen fish market, CAS 62443, 338 mm; CAS 61466, 208 mm; CAS 62262, 3: 177–186 mm. EASTERN AUSTRALIA: Queensland, near Bundaberg, QM 21314, 270 mm; QM 21315, 105 mm. New South Wales, Laurieton, AMS IB.2489, holotype of *Altiserranus woorei*, 286 mm; AMS IB.4717, 347 mm. WESTERN AUSTRALIA: Dampier, WAM P. 26876-001, 555 mm.

Relationships

In the structure of its cranium, *Triso* is most similar to the New World genus *Paranthias* Guichenot. Katayama (1959) noted that the neurocranium of *Triso* is distinctive in having well-developed, laterally inclined, fronto-parietal crests and a parasphenoid that turns upward at a point just below the basisphenoid so that its anterior half is obliquely oriented. A comparison

of Katayama's neurocranium illustrations (his figs. 18–19) clearly shows that the cranium of *Triso* is also notably foreshortened relative to that of other epinephelins. Smith (1971) noted the presence of the same distinctive neurocranial features in his diagnosis of *Paranthias* (see his fig. 5) which he considered to represent the most distinctive lineage among the American groupers. In his discussion of structural trends, Smith stated: "The high inclined frontoparietal crests of *Paranthias* are specialized in keeping with the foreshortened skull and angular parasphenoid." Our examination of cleared and stained specimens of *Triso* (BPBM 30844) and *Paranthias* (USNM 65606, 147.5 mm; USNM 284744, 90 mm) substantiate the observations of Katayama (1959) and Smith (1971).

Based on the outgroup relationships for the Epinephelini discussed by Johnson (1988) and available comparative information, the cranial features shared by *Triso* and *Paranthias* are uniquely derived among epinephelins and suggest that these two genera may be sister taxa. Also unique to both genera is their small head relative to the length of the body. In addition, *Triso* and *Paranthias* share a high number of dorsal-soft rays (18–21 and 18–19, respectively) and lateral-line scales (67–76 and 69–77, respectively). Although these meristic features are not limited to these two genera within the Epinephelini, few species of groupers have such high dorsal-soft ray and scale counts and fewer still have high counts for both.

Triso and *Paranthias* also share a distinctive predorsal configuration, but polarity for this character is equivocal. The presence of only two (or fewer) predorsal bones is a synapomorphy of the subfamily Epinephelinae (Johnson, 1983). In *Nippon* (the second outgroup for the Epinephelini), the two predorsals are robust and expanded dorsally (T-shaped) (see Johnson, 1983: fig. 9). In the Diploprionini, Grammistini and Liopropomini (together the first outgroup for the Epinephelini), and most members of the Epinephelini, these bones are considerably reduced in length and breadth and have no dorsal expansion (see Johnson, 1983; figs. 3, 5). Reduction of the predorsals relative to those of *Nippon* is a synapomorphy of all epinepheline tribes above the Nipponini; however, the predorsals of *Triso* and *Paranthias* (Fig. 2B, C) are longer than those of

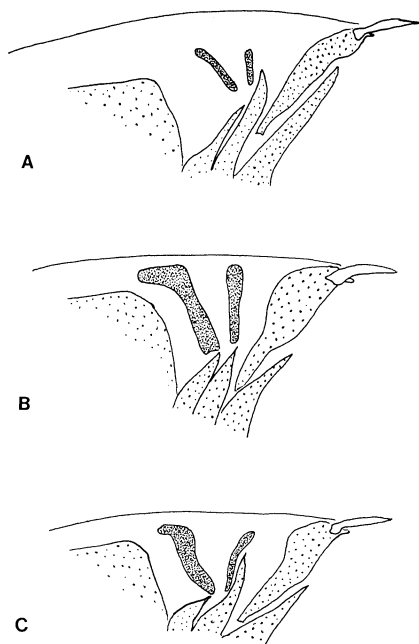


Fig. 2. Configuration of predorsal bones (densely stippled) drawn from radiographs. A, *Epinephelus morio*, GMBL (Grice Marine Biological Laboratory, Charleston) 73-133, 336 mm SL; B, *Triso dermopterus*, USNM 17777, 533 mm SL; C, *Paranthias furcifer*, GMBL 73-134, 273.3 mm SL.

other epinephelins (Fig. 2A) and those of the Diploprionini, Grammistini and Liopropomini, and the first predorsal is relatively robust and bears an anterodorsal expansion. Because polarity is equivocal, we hesitate to interpret the larger predorsals as a synapomorphy of *Triso* and *Paranthias*, but the notable resemblance in their configuration relative to the other epinephelins suggests to us that this condition may be uniquely derived, an interpretation that is congruent with the cranial evidence.

Another derived feature shared by *Triso* and *Paranthias*, lack of fusion of the first scalelet to the posterior margin of each scale, is also shared by *Epinephelus*, *Mycteroperca* and other genera and thus neither refutes nor supports the *Triso-Paranthias* hypothesis (see Smith-Vaniz et al., in press: fig. 1, for illustration and discussion of polarity of this character).

Of several differences between *Triso* and *Paranthias*, only one is inarguably incongruent

with the evidence discussed above. The number of dorsal spines differs for the two genera, 11 in *Triso* vs. 9 in *Paranthias*. Polarity of dorsal spine number was discussed by Johnson (1988) and Smith-Vaniz et al. (in press), and it was concluded that 11 spines is the derived state, shared by *Epinephelus*, *Mycteroperca* and probable allies, with the 9 (or fewer) spines of *Cephalopholis* and other genera being primitive. If, as the weight of evidence indicates, *Triso* and *Paranthias* are sister taxa, the dorsal spine number has been derived independently in one of them.

Triso and *Paranthias* also differ in body shape. The body is substantially deeper in *Triso*, and, as is usual for deeper-bodied fishes, the interorbital is more convex due to encroachment of a thicker mass of epaxial musculature onto the cranium. However, the ranges of body depth for both *Triso* (2.4–2.7) and *Paranthias* (2.7–3.4, converted from Smith, 1971: table 2) overlap the ranges exhibited by *Epinephelus* (2.4–2.7) and *Cephalopholis* (2.6–3.2) species (see Smith-Vaniz et al., in press: table 1), and we are unable to interpret this character cladistically. It is, perhaps, important to note that the differences between *Triso* and *Paranthias* in body depth and relative muscle encroachment on the cranial surface are not reflected in the cranial configurations.

Other obvious differences are autapomorphic for one or the other genus and are thus phylogenetically uninformative. *Triso* is unique among epinephelins in having esophageal pouches. *Paranthias* is likewise unique in having a deeply forked caudal fin and lacking a supramaxilla.

In summary, the available evidence supports the hypothesis that *Triso* is more closely related to the New World genus *Paranthias* than to any other members of the Epinephelini. However, in the context of this limited analysis, we cannot discount the possibility that the observed similarities have evolved independently through adaptation to similar ecological niches. Both species are reported to be unusual among epinephelins in that they typically swim freely above the bottom, apparently feeding on prey that are well up in the water column (Randall, 1967: 704). *Paranthias* appears more highly specialized for this behavior and is apparently a more active swimmer, as indicated by its deeply forked caudal fin and shallower body. The foreshortened cranium, upturned parasphenoid and small mouth

shared by both genera are clearly well adapted for water-column feeding. Only a comprehensive cladistic analysis of the Epinephelini involving all species and additional independent characters can resolve the question of possible convergence in skull morphology. For a further discussion of the vagaries of epinephelin phylogeny, see Smith-Vaniz et al. (in press).

Acknowledgments

We thank the following individuals for providing specimens or pertinent information for the present study: M. Aizawa, M. E. Anderson, C. Araga, J. B. Hutchins, J. Johnson, R. J. McKay, J. R. Paxton, H. A. Randall, and R. Whalley.

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トビハタの新属名と類縁関係

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トビハタの学名は従来 *Trisotropis dermopterus* (Temminck et Schlegel) とされていたが, *Trisotropis* Gill は *Mycteroperca* Gill のシノニムなので, 新属名 *Triso* を提唱する. 本属の特徴は, 頭部が短く, 両眼間隔域が広く, 他のハタ族より前後に短い頭蓋骨をもち, 副蝶形骨が前方に傾くこと, 前頭骨と頭頂骨の隆起が高くて側方を向くこと, 背鰭鰭条数が多いこと, 食道部が袋状に広がっていることである. オーストラリアのニュー・サウス・ウェールズから知られている *Altiserranus woorei* Whitley はトビハタのシノニムである. *Epinephelus multinotatus* (Peters) を模式種とする *Altiserranus* Whitley は *Epinephelus* Bloch のシノニムである. トビハタは北半球では日本, 韓国, 台湾および中国に分布し, 南半球ではオーストラリアの東岸と西岸に分布する. すなわち, 本種は熱帯域には分布しない. トビハタ属は新世界の *Paranthias* Guichenot に最も近縁と考えられる.